NESTING OF THE SNOW BUNTING ON BAFFIN ISLAND

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FINANCED by a generous grant-in-aid from the Arctic Institute of North America, we spent part of the summer of 1953 (June 14 to August 22) studying the birdlife of southern Baffin Island. Our headquarters were at a United States Air Force Base near the head of Frobisher Bay, just south of the Arctic Circle. We walked considerable distances daily, covering regularly and fairly often an area about 18 square miles in extent. This area was bounded on the west by the Sylvia Grinnell River and Davidson Point, on the east by the high eastern shore of Tarr Inlet. Twice we journeyed by boat to the mouth of the Jordan River and the famous Silliman's Fossil Mount, about 16 miles west of the Base. By courtesy of the Royal Canadian Air Force we flew to three other parts of the island: the southeastern corner of Lake Amadjuak at Lat. 64° 38′ N., Long. 70° 28′ W.; a lake just inland from Cape Dorchester, near the northwestern tip of Foxe Peninsula, at Lat. 65° 20′ N., Long. 77° 10′ W.; and a lake about 50 miles east-northeast of Wordie Bay, along the west side of the island, at Lat. 68° 31′ N., Long. 71° 22′ W.

The country we covered was rough "desert tundra" (Soper, 1940:16) for the most part. The Base at Frobisher Bay was on a grassy flat, but hills rose to the northwest, north, northeast, and east. The slopes were half-covered with snow when we started our work, though the lowland flats were bare. The weather was fairly comfortable during the latter half of June, but July was gray, raw and unpleasant, a notable meteorological phenomenon being the foul inclemency accompanying a southerly wind. The whole Bay was ice-covered, of course, and the mingling of the warm wind with the cold air above the ice produced fog. In August we had some gloriously bright, still days, but even in the warmest weather we rarely stepped outdoors without extra clothing.

Of all the birds we saw, the Snow Bunting (*Plectrophenax nivalis*) was commonest; it was also the *only* bird we recorded at all the localities mentioned above. About the Base proper it was less familiar than the Lapland Longspur (*Calcarius lapponicus*) as a dooryard bird, and it obviously did not have that species' preference for grassland, but we saw and heard it daily about the big hangar and other buildings, near the tents of the Eskimo village, and at the dump. It was sometimes noticeable along the beach just above high-tide mark, or out on the tidal flats themselves. It was the only small passerine bird that we saw at all regularly on rocky peninsulas and offshore islets. It nested almost exclusively among the rocks, but in mid-summer it often flew considerable distances out onto the grassy lowlands, sometimes crossing lakes, rivers, or stretches of salt water in reaching places at which

food was readily obtainable for nestlings. We saw it repeatedly in the monotonous high interior: but it was less common there than in the rough land near the sea.

When we started our observations on June 15 we instantly perceived that most of the Snow Buntings were paired. Occasionally we noted a separate male, a separate female, or two females feeding together by themselves. But the flocks had broken up. A south-southwest wind blew steadily all that day. The sun shone brightly part of the time, however; we saw three bumblebees; and a few flowers were in bloom. The male buntings were in boldly black and white feather, but scrutiny through our binoculars revealed extensive brown edgings on the back and rump plumage of two individuals, and a dark nape-patch on three others. The bills of both males and females were black, without a trace of yellow. Males were singing everywhere, some of them volubly. We witnessed one flight-song. The most characteristic callnotes seemed to be *pit-i-tick*, *chew*, *chew-kit*, and *djjj* (a soft *g* sound, imitable through pronunciation as one syllable). Whether singing or feeding, the birds obviously disliked the wind. In sheltered areas among the rocky hills we found them, pair by pair. A favorite feeding-place was the edge of a snowbank. Walking on the snow itself, the two birds stayed close together, often only a few inches apart, almost invariably facing in the same direction. They seemed to be finding something on the snow—minute seeds or insects presumably. They were silent most of the time so long as they were together; but if one flew off, the other showed concern through calling and standing high with head held up attentively. Separations of this sort were usually the result of a male's leaving to drive off another male. All the males seemed to be established on, and defending, territories. Males who were with females sometimes lifted their wings high above their backs, or scuttled rapidly through the snow, with head lowered, as if showing off. "Scuttling" males sometimes ran swiftly in one direction, stopped, turned at a right angle, and scuttled off again. We did not see a female behaving in such a manner.

We were puzzled by our failure to find nests. We saw many female birds, but not one of them flew up from underfoot, as if from a nest; not one acted as if she were gravid and waiting to lay an egg; and pairs were so indifferent toward us that we wondered if nesting had even begun. Actually, as subsequent findings proved, many nests had been completed, and eggs laid, by June 15. Clutches were incomplete, however; steady incubation had not started; and, for reasons not clear to us either then or now, the birds voiced no objection to our presence. We must have walked close to several nests, but we did not hear a single cry which sounded to us like a note of protest or distress.

In mid-morning, on June 15, we spent about an hour watching a pair which

obviously had established themselves in a long, sheltered groove on a rocky ridge about a quarter of a mile north of the building in which we lived. The ridge rose abruptly from the broad tundra flat, and was the first and lowest of a series of foothills leading up to the high interior. The birds kept to the ground most of the time. They were on the move almost constantly, but their wandering seemed to be desultory. They were inseparable. They must have been feeding, but we never saw one chew at a berry, crack a seed, or pick an insect to pieces. Jabbing at the snow or moss, they obtained minute items which they swallowed rapidly. While on the snow their walking or running gait was easily perceptible. When obliged to cross a wide stretch of snow they both ran, with lowered heads, as if eager to reach the other side. The male did not sing.

At about 11 o'clock both the male and female disappeared for a short time in a shadowy place under some boulders. When they came into full view again, the female had a piece of grass in her bill. She nibbed at this, as if testing its pliability, dropped it, then picked it up again. Carrying it, she walked rapidly about 50 feet across moss, rocks and snow, straight to a crack in a sloping rock about three feet above a big snowbank. The male, considerably to our surprise, made no attempt to copulate, though he followed her closely. The female entered the crack without the slightest hesitation and the male flew off downslope.

The female was out of sight a minute or more. When she reappeared, her bill was empty. She preened a wing briefly, gave a *djjj* cry, evidently heard a response (though we did not), and flew off to join her mate. In vain we waited for her to return with more grass, or for the male to sing. Suspecting that what we had observed had not been nest-building at all, we went to the crack to investigate. We could not reach our hand in very far, and our groping fingers failed to discover anything which felt like a nest, so we removed some loose stones. About 15 inches in from what had been the entrance, and a foot below it, lay a few pieces of dry grass. Wondering whether the true nest might be far back somewhere, well out of sight and reach, we replaced the stones. The snowbank in which we stood was four or five feet deep. A meltwater pool was at its lower end, about 40 feet south of us. The buntings themselves were nowhere to be seen.

The following day we saw many pairs of buntings, occasionally noted a separate male or female, and observed several flight-songs, but we did not flush a female from her nest. Songs seemed invariably to include a repetition of certain polysyllabic phrases. Ordinary songs (*i.e.*, songs not given in flight) sounded like (1) *sir plee si-chee whee-cher; sir plee si-chi whee-cher* and (2) *chor-i-bee-chee, chor-i-bee-chee, chip-i-deer.* Flight-songs were more

complex. We decided against disturbing the moot nest-site lest we cause the birds to desert.

On June 17 we watched pair after pair, convincing ourselves that not one of the females was nest-building. We observed little wrangling amongst males. Females who were with males seemed to be spending all their time looking for food. Not once did we see a male attempt to copulate, or a female squat with fluttering wings as if inviting copulation. Separate females seemed quite content: they fed part of the time, preened their belly plumage occasionally, sometimes merely perched on the top of a rock. We witnessed several flight-songs, but no male confined his performances to flight-songs. In the afternoon we visited the moot nest-site. No bird flew out, nor was a nest visible through the cracks. We did not move the stones.

On June 18 we walked about four miles up the Sylvia Grinnell River. We saw and heard buntings virtually wherever we went. Below the eyrie of a pair of Peregrines (*Falco peregrinus*) we picked up the remains—wing and tail feathers principally—of several Snow Buntings.

On June 19 we ascertained that there was a nest at the "moot nest-site" just where the two or three pieces of grass had lain on June 15. The nest appeared to be complete except that the grass lining was wholly without any feathers, hair, or bog-cotton (*Eriophorum*). We neither saw nor heard a bunting close by. About 300 yards to the south we found another nest (No. 2), with five eggs, at the bottom of a narrow crack in a huge rock. We found this nest in an unexpected way. Happening to see a lone female bunting hurriedly feeding at the edge of a patch of gravel, we kept her in sight until, her hunger apparently satisfied, she flew east toward the high country, made straight up the slope to the big rock, and disappeared in the crack. The single flight, from feeding-spot to nest-site, was fully 300 yards. When the female left the nest at our approach, she lingered close by, chirping. Her mate did not join her.

A fight we witnessed on June 19 was probably territorial. How the fight started we did not know: suddenly, there in the snow, two female buntings were battling savagely, biting each other and rolling over and over with wings fluttering. Pausing, as if to catch breath, they faced each other with beaks open, then resumed the attack. A male bird, almost certainly the mate of one of the females, stood close by, but did not join in the fight. When another male appeared, a moment later, the two males came to grips five or six feet from the fighting females, but they did not fight very hard. We thought for a time that one female might actually kill the other: but suddenly one of them flew off, with the other in hot pursuit, and the two males flew away in the same direction. Presently a male and female returned and settled down to feeding along the edge of the snow. Tinbergen (1939:27),

reporting his observations on the Snow Bunting in east Greenland, says: "Mated females do not tolerate other females in their neighborhood. Fights between two females were of common occurrence."

On June 20 we collected a pair of buntings (GMS 11714–5), ascertaining that the testes of the male were greatly enlarged and that the oviduct of the female was much swollen. This was additional proof that egg-laying was going on.

From June 20 on we continued to find nests, most of them with full sets of eggs or broods. Kumlien (1879:76) obtained "first eggs" for the season on June 20 in Cumberland Sound. At Lake Nettilling, Soper (1946:424) found the first full sets of eggs for the 1925 season on June 20; at Camp Kungovik, near the head of Bowman Bay, in 1929, he did not find full sets until "the early days of July." At the head of Clyde Inlet, in 1950, Wynne-Edwards (1952:387) found the first nest for the season on June 25. It contained "four young two or three days old."

The appearance of the nest found by us on June 15 had changed considerably by June 20, for much white material, dog hair principally, had been added to the lining. Only Sutton visited the nest that day. When, at 5:50 a.m., he approached the nest, he was greeted not by the female but by the male, who flew up companionably, alighted in the snow only a few feet away, and preceded him to the nest-entrance. Here, showing great solicitude, the bird stood, now looking in and down at the nest, now out and up at the man so close by. The nest was empty and the female was nowhere to be seen. Sutton waited in the vicinity for 40 minutes. During this period the male never left the nest very far; flew to the entrance four times, each time looking in; was not in the least secretive; and sang repeatedly. His callnotes were varied. Frequently a *tick-i-ty* or *pit-i-ty* note was followed, after a brief pause, by *chew-kit*. Occasionally the call was *djjj*, which seemed to be an inquiry as to the female's whereabouts. Knowing full well the value of data obtained from color-banded birds, we nevertheless decided against any banding or marking of the adults at this nest before there were eggs or young. Where the female was that morning, no one could say: we believe she was alive, however. Often, during subsequent observations at this and other nests, we failed to see the female or male for surprisingly long periods.

We did not visit Nest 1 on June 21. On June 22 we visited it at 5 a.m., finding one egg in it. In the lining there were now a few white ptarmigan feathers. We remained in the vicinity for 20 minutes, seeing neither the male nor the female. We wanted to mark the egg, but failed in our attempts to take it from the nest. Each time we moved loose stones, pebbles fell and we did not want to risk breaking the egg. A hand could reach the nest, fingers

could grasp the egg, but the narrowness of the crevice prevented drawing out the closed hand.

On June 23, at 5:20 a.m., we went to the nest. No bird flew out. There were two eggs. The eggs and nest were warm to the touch. Failing to see either bird, we decided to look for them. We finally found a pair, quietly feeding, about 200 yards to the southeast and well above nest-level. We were not sure that these were the owners of the nest, but they were the only buntings we saw anywhere in the vicinity. After experimenting with a pebble, we found that by turning the closed hand holding an egg, then partly opening the fingers with the palm up, an egg could be brought out successfully. We marked the two eggs, each with one red dot. We visited the nest at 9:30 p.m. (cloudy; raining slightly), finding neither bird there. There were only two eggs.

Very early (1:35 o'clock) the following morning, Parmelee went to the nest. The weather was still gray and twilight seemed to be at its deepest. While Parmelee was searching for a place from which to observe, the female bunting left the nest (1:40). Immediately she was joined by the male, who apparently had been roosting among rocks about 50 paces to the southeast. The nest held only two eggs. Parmelee concealed himself with blankets about 30 paces from the nest. The male bunting stayed close by, but neither bird seemed agitated. The female returned to the nest at 1:56. At 1:59 the male sang a full song and the female again left the nest. At 2:01 she returned and settled down. The male now stood guard on one of two favorite big rocks a few rods away. Squatting and flattening himself out, he kept an eye on Parmelee almost constantly for the next three hours. At 2:47 and again at 3:24 he sang a full song. At 3:29 he sang three full songs in quick succession. At 3:31 he sang another full song. At 3:50 he chased off a male Wheatear (*Oenanthe oenanthe*) which had flown upslope from the west and alighted within a few inches of him. (We did not know it at the time, but a pair of Wheatears had a nest just over the little ridge to the west, about 40 paces from the bunting nest.) At 4:02 the male bunting sang a full song. At 4:49 he sang three songs in quick succession. At 5:15 he flew to the nest-entrance, went in, came out with a white feather in his bill, and flew back to his favorite rock. At 5:17, of her own volition apparently, the female left the nest, flew to her mate's favorite rock, and with him disappeared downslope. The nest now held three eggs. Between 5:30 and 5:45 the male sang 12 full songs.

Tinbergen (1939:34) states that incubation "begins from one to three days after completion of the clutch." On June 24 the female spent a good deal of time incubating the three eggs. We visited the nest about 1:00 p.m., finding her on the nest and the male a few yards away. Both were remarkably con-

fiding. Hesitant though we were to disturb the birds, we nevertheless examined the nest several times to make certain that the female was actually incubating. Each time we went to the nest the female left reluctantly, disclosing three eggs. The male behaved as if our visits were no cause for alarm. While we were at the nest, the female walked or ran about, looking at us, our equipment, and the entrance to the nest inquiringly. If we stood off a way, she ran or flew to the nest-entrance and looked in. More than once she went in, but promptly came out again. From about 3:00 to 4:30 o'clock, while we were seated on rocks 20 yards away, the female was quiet on the nest, the male equally quiet on the top of a boulder. Part of the time he squatted and flattened out, as if dozing, but his eyes stayed wide open.

We do not know just when the fourth egg was laid, but we first saw it at 1:45 a.m. on June 25. At that time the female was on the nest but the male was nowhere to be seen. The female refused, at first, to leave the nest-crevice. We spoke to her, reached our hands in toward her, even touched her several times. Finally she hunched herself into a crevice just back of the nest while we removed the eggs for marking. When the nest was empty, she came forward, looked into it quizzically, then out at us, and retreated into the crevice. When we put the eggs back, she moved forward and settled down. After warming the eggs for a minute or so, she fluttered from the nest-crevice, alighted a few feet away, and ran about the rocks. Her manner was very gentle. She made no vocal sound. Presently she went back to the nest, settled on it, and stayed there. At 5:07 the male, who had not been in evidence, appeared with a mouthful of food. He went directly to the nest. We heard odd, rather angry-sounding cries of *churr, churr*. We could not, of course, see what was going on, but when he came out again, 30 seconds later, he had nothing in his mouth. He flew off a hundred yards or more, out of sight behind some rocks. The female continued incubating until 5:16, when, for no apparent reason, she left for about 45 seconds. Returning, she settled down for more than an hour of incubation, during which period the male came several times with food. At each visit the male completely disappeared in the nest-crevice and the quarrelsome-sounding *churr, churr* accompanied the feeding (presumably at the nest proper). We discontinued our observations at 6:30 o'clock.

Thus far we had failed to ascertain at all exactly when the eggs were laid, though obviously they had arrived daily, about 24 hours apart. Convinced that the female was by this time much attached to her nest, we began taking liberties. Parmelee stayed near the nest from midnight to 3:40 a.m. on June 26, at which hour Sutton took over. At 3:40 we forced the female to leave the nest: there were four eggs. At 4:00 o'clock we again forced the female to leave: there were still four eggs. At 4:55 she left of her own accord. There were five eggs. She was away from the nest only a short time. We withdrew

and allowed her to settle. Deciding that the eggs should be marked before we left, we went to the nest. The female refused to leave the nest-crevice. This time, from her hunched up position just back of the nest, she chirped several time, as if for help, but the male neither answered nor flew up. About 5:30 she fluttered from the nest, flew off a way and joined the male. Presently she returned, followed by the male. After she had settled, he too went inside, and we heard the usual "*churring*." In this case the sound probably did not accompany feeding, for the male had had no food in his mouth.

On June 27 (7:45 a.m.) and June 28 (8:00 a.m.) we visited the nest. The female was on the five eggs at each visit. From this time on work elsewhere prevented our visiting the nest very often. On July 4 (1:10 p.m.) we happened by, flushed the female, noted that the five eggs were there, and saw the male fly directly to the nest with food. He expected to find his mate on the eggs. When he emerged from the nest-crevice with mouth still crammed with food, the female flew to him promptly, and we witnessed feeding outside the nest. The female lowered her head, opened her mouth wide, gave the growling *churr*, and fluttered one wing as she received the food. As she walked into the nest the male flew off. About 10 minutes later he returned with more food (among which was a pale green insect larva) and went in to the nest. An instant after he had disappeared we heard the *churr* of feeding.

On July 6 we visited the nest, forcing the female off. There were five eggs. On July 7 we did not visit the nest. On July 8, at 4:50 a.m., the nest held four young and one egg. The natal down was mouse gray. Three of the young were noticeably larger than the fourth, which had obviously just hatched, for its down was damp. The remaining egg bore one of our red dots: it was the last egg laid. We caught and banded the female. This perturbed her, but she did not leave the vicinity. We continued our observations for some time, noting first that the young birds, though obviously eager to be fed (for they opened their mouths wide when touched), *made no vocal sound of begging*. We waited more than half an hour before either parent went to the nest with food. At 5:25 the male brought food, went in to the nest, and left without a fecal sac. At 5:35 the female (without food, so far as we could see) went to the nest. Before settling down, she walked in and out twice. We last examined the fifth egg at 1:00 p.m. It was very slightly bashed-in on one side, probably from our frequent handlings.

On July 9, at 5:10 a.m., there were five young in the nest. The damaged egg had hatched successfully. The incubation period of the fifth egg had been at least 12 days and 9 hours; at most 13 days, 1 hour, and 10 minutes. Wynne-Edwards (1952:387) reports a period of 12 days "from last egg laid to last chick hatched." The fifth young was noticeably smaller than the others, and quite dry. We arranged the five siblings in a row, noting that

the two largest were of almost exactly the same size; that one was slightly smaller than these two; that one was still smaller; and that the fifth was very small in comparison with the two largest. All five opened their mouths for food, even after being taken from the nest, but if any of them made the slightest vocal sound, we failed to hear it.

On July 10, the two or three largest young produced a slight noise when begging for food, but the youngest made no noise at all, though it opened its mouth wide and seemed to be as healthy as the others. The begging cry gradually increased in volume from this date on. On July 11, when we removed

Fig. 2. Female Snow Bunting on nest. Photographed by George Miksch Sutton on Southampton Island on July 2, 1930.

the five young from the nest, only one of them, the smallest, opened its mouth for food. Some instinct may have prompted the others to keep their mouths closed. On this date we observed both the male and female parents bringing food and carrying away fecal sacs. Both parents carried food to the nest direct, *i.e.*, the male did not give food to the female, and vice versa.

On July 15 there were only four young in the nest (we did not visit the nest July 13 and 14). One was definitely smaller than the other three. We had no way of knowing, of course, whether this smallest bird had hatched from Egg 4 or Egg 5. The four young were begging noisily as we approached

the nest, but they instantly became silent when we touched one of them. We looked in vain for evidence that a lemming (*Lemmus trimucronatus* or *Dicrostonyx groenlandicus*) had visited the nest or taken the young bird. Lemmings of both kinds were common in the vicinity.

On July 17 only three nestlings were alive. All three were active, and one scrambled into the crevice back of the nest and would not come out. A flattened dead one was under the others. We banded and color-banded two of the young (right leg, blue over aluminum). The young were at least 9 days old, at most 11 days old, and had not yet left the nest proper. They were not, so far as we could ascertain, troubled with mites or other nest-parasites. The parent birds were still carrying off fecal sacs. The begging of the brood we could hear fully 30 paces down-wind (prevailing wind velocity: 10 mph). Nicholson (1930:299) states that the nestlings' "chittering . . . carried quite 150 yards."

We journeyed to the Jordan River mouth on July 17, and were away from the Base for several days. The brood probably left the nest-crevice at Nest 1 about July 20. When we visited the nest on July 21 we could not find the young anywhere. The nest was empty save for a great mass of feather-sheath particles and some droppings about the rim. Success: of five eggs, all hatched. Of five young, three probably fledged. Rearing the brood required about five weeks (June 15 to about July 20). During this same period we found 21 other nests, some of which we visited regularly.

Nest 2. Found June 19. Five eggs. About 300 yards south of Nest 1, at the bottom of a deep, ten-inch-wide, almost vertical crevice in a great rounded outcropping of rock. We could just touch the contents of the nest with arm fully extended. We flushed the female from her five eggs on June 20, 21, 22, 23, 27, and 28, and on none of these visits saw the male. On July 1 we saw the male, not the female. On that date the nest held three (possibly four) young and one egg. On July 5, 6, and 7 all we could see or feel was young birds, so we supposed that the five eggs had hatched. On July 8 we visited the nest about noon, just as sunlight struck part of the rim directly. We clearly saw the heads of two young, and perceived that there was at least one more. Using a bit of netting attached to a big wire hoop, we caught the female parent and banded her. We almost caught the male too. Neither parent bird would creep directly under the net in entering the crevice, but both tried repeatedly to go straight down through it. They stood on it and walked on it, without, strangely enough, becoming entangled. When they entered the crevice they did so well to one side of, or below, the net. We caught the female with a surprise rush, forcing her to fly directly from the nest into the net. On July 10 we could see at least three young. One of these scrambled from the nest when touched with the fingers. On July 12 we could see three young, all of them "at large" in the crevice. They appeared to be strong enough to fly. Both parents were near the nest. Both carried food to the young direct (*i.e.*, the male never gave the food to the female, or vice versa), and they did not go to the nest together. Neither was carrying off fecal sacs, for the young were no longer in the nest proper. On July 16 the young were gone, but there was still an egg in the nest. Fledging period: at least 12 days, probably more. Success: of five eggs, four hatched. Of four young, at least three fledged.

Nest 3. Found June 22. Five eggs. In a shallow, eight-inch-wide crevice in a vertical rock-face on the west side of a canyonlike stretch of the "HBC River" (our name for a small river which emptied into Frobisher Bay near the Hudson's Bay Company post). Examining the nest was difficult, for it was ten feet above the only solid footing we could find. It was only a few inches back in the crevice, however, so could be reached with the hand once we had climbed to nest-level. We found it through seeing the female leave. While we were trying to photograph it, the female stayed very close. The male, less concerned or less confiding, flew up once, but quickly departed. We collected the nest and five eggs. In each egg was a small embryo.

Nest 4. Found June 21 by a workman who saw the female go to it with a white feather for the lining. It held four eggs on that date. We first saw it June 23, when it held five eggs. It was under a big rock in the rubble along a steep stretch of construction-road and was alongside the rock on damp gravel rather than closely fitted into a crevice. We could ascertain its contents only by reaching our arm, full-length, under the rock. On June 26 we flushed the female from her five eggs. On June 28 there were five eggs, and both the male and female were near the nest. On July 23 the nest was empty. A mass of feather-sheath particles indicated that several young had lived there for some time. Success: five young probably fledged.

Nest 5. Found June 23, during a snow-storm. Five eggs, slightly incubated. In high country about a mile northeast of the Base, back about a foot in a crevice under a large stone. The female entered at nest-level, but when she left she flew from a hole several inches above the nest. We collected the two adults (GMS 11719,-20), the nest, and the eggs.

Nest 6. Found June 24. Five eggs. Saw the male fly to the nest-entrance with food for the female, who was incubating. On high land about 500 yards east of the Base, in a deep vertical crevice so far down and back that we could not reach it. We visited this nest rather regularly. We first saw young in it on July 4. On that date we saw the male go to the nest-crevice with food. On July 5 we saw one egg in the nest, so assumed that there were four young. On July 10, we clearly saw three young and an egg; on July 12 two young and an egg; on July 16, three young (two inside the nest-cup; one outside it) and an egg. At least one young bird appeared to be ready to fly that day, but none of the brood actually left before July 17. Fledging period: 13 days. Success: of five eggs, four hatched; of four young, at least three fledged.

Nest 7. Found June 24 in high interior about a mile east of the Base. Five eggs. Discovered through seeing the female fly out when we struck a pebble against rock several yards away. Nest in crevice under turf and a large loose stone which rested precariously on steeply sloping rock about 10 feet above a wide stretch of marshy tundra. Entrance to crevice several inches below nest-level, but easiest way to determine contents was to stick arm down through hole in the moss from above. One of the five eggs was partly buried in the lining. On July 4 and July 6 we flushed the female from five eggs. On July 9 the nest held three small young, one hatching egg, and one egg whose translucency indicated that it held no embryo. Here the incubation period for at least one egg must have been 15 days—providing, of course, that incubation actually started on June 24. In this case the female may not have started incubation until "one to three days after completion of the clutch" (Tinbergen, *loc. cit.*). Success: of five eggs, four hatched. Of four young, four probably fledged.

Nest 8. Found June 26, when partly finished. Under a comparatively small slab of stone resting on turf and rock on a steep slope about two miles north of the Base. Could see nest without moving slab, but determination of contents required moving it. Watched female nest-building for half an hour late in the morning on June 26. In all her trips she

was accompanied, back and forth, by the male, but he did not go into the nest-crevice. Much material (dry grass) she found under heaps of metal rods lying about 20 yards from the nest. We did not visit this nest again until July 11, on which date there were five eggs. On July 26 there were five young, almost ready to leave. These were obviously of different ages, three being larger than the other two, and one being definitely smaller and less active than the rest. We banded all five. Success: all of five eggs hatched. Of five young, all probably fledged.

Nest 9. June 26. Seven fresh eggs. On steep talus slope in rough country about two miles north of the Base; in crevice between loose, angular stones about ten inches back. Found through watching the female go to the nest. Nest and eggs collected.

Nest 10. Found June 26. Seven eggs. In crevice among rocks along base of steep ridge just above bed of small swift stream about two miles north of the Base. Saw female go to nest. Male also in vicinity. On July 3 the nest held four young and three eggs, the latter all highly translucent. On July 11 the nest held three young and three eggs. Both the male and female were at the nest that day. We saw the female carrying a fecal sac from it. We did not visit it again. Success: of seven eggs, four hatched. Of four young, three may have fledged.

Nest 11. Found June 27. Six young of assorted sizes, three of about the same size, but larger than the others; one conspicuously smaller than the other five. Nest in pile of loose stones near dump; in moist sand, under three big angular stones. Lifting one stone nicely exposed the nest to view. We visited the nest June 29, expecting to find some of the brood dead, for one of a nestful of young Horned Larks (*Eremophila alpestris*) we had been watching had perished, presumably as a result of the bad weather. The female flew out as we approached; the young were all in good condition. On July 1, when we lifted the stone and touched the young, five of them scampered into crevices nearby. We collected a middle-sized one (female, GMS 11737) and returned the others to the nest. They quieted down when covered by the hand. The collected specimen's bill was dull corn yellow. Its underparts were suffused with faint yellowish buff, its chest indefinitely streaked with dusky. Shaggy natal down clung to the sides of the crown and of the hind-neck. The tail measured 16 mm. On July 2 we banded the remaining five of the brood. Three of them bolted from the nest as we removed the stones. The tails of these must have been fully 20 mm. long. On July 4 an adult male bunting near this nest was caring for two stub-tailed but fairly strong-winged young while the female (only) was caring for the young still hiding among crevices. Success: of six eggs, all hatched; of six young, five fledged (the sixth probably would have fledged had we not collected it).

Nest 12. Found June 27. Four eggs visible. Near the sea, at the base of rocky outcropping on Davidson Point, in crevice between large stones about two feet back and down. Crevice much too narrow to permit reaching hand and arm in. Saw female go to nest. We re-visited this nest only once—July 12. That day we could see at least three well developed young in the nest-crevice. Success: of four (perhaps more) eggs, at least three hatched.

Nest 13. Found July 5. Four (possibly more) small young. In narrow crevice among large stones in high country about half a mile east of the Base. Flushed female as we were walking over rocky ground. Could not reach hand into crevice and could not move stones. On July 10 both the male and female were at the entrance to the nest-crevice. We could see at least three young well developed enough to scamper about when we peeked in. Fledging period: at least 11 days. Success: at least four young fledged.

Nest 14. Found July 5. We could see young birds in the nest, but could not count them. Nest 300 yards from the sea, on Davidson Point, about 20 inches down among large stones along the edge of an outcropping. Both male and female at nest. On July 12

we removed some of the stones and found four young, all well developed and able to scamper about vigorously. In the nest was also one translucent egg. We put red color-bands (only) on the four young, noting that the brood seemed to be of equal size. At least one of them could fly a little. Success: of five eggs, four hatched. Of four young, all probably fledged.

Nest 15. Found July 5 by F. Stuart Haley, who noted that there were "several" young on that date. Nest on a steep rocky slope above a lake about a quarter of a mile southeast of the Base, in a very narrow crevice about 14 inches in and down. On July 16 we visited the nest, finding five young birds in the immediate vicinity. Two flew strongly down the slope from the mouth of the nest-crevice; two were on a ledge about 24 inches from the nest, crouching among the stones; and one was about 15 feet down the slope from the nest. Success: five young left the nest, all more or less able to fly. Fledging period: at least 11 days, almost certainly more.

Nest 16. Found July 9, in high interior about five miles southeast of the Base. Under a stone, in damp ground, in open grassy tundra nowhere near a rocky outcropping or ridge. Only nest of this sort we found the whole season. Contents: two small young and five eggs, one of which was so obviously without embryo and so nearly immaculate that we preserved it as a specimen. The other four eggs were opaque and appeared to be at the point of hatching. We did not visit this nest again. Success: of seven eggs, six probably hatched. On July 9 we watched a company of fifteen or more buntings, most of them males, obtaining food for nestlings on a gentle slope just above a widening of a little river not far from this nest. The birds seemed to be catching dipterous insects of some sort, perhaps crane-flies. Many of the flies they caught on the wing. When the birds flew off with a load of food some travelled up over the hilltops hundreds of yards away. Both Tinbergen (1939:36) and Nicholson (1930:298) report the gathering of food in areas apparently outside the territory.

Nest 17. Found July 10. Four young (no indication that five eggs had been laid). In crevice among stones on steep slope about 40 paces from the west bank of the "HBC River." Could reach nest easily with hand. The four young were of assorted sizes, the two largest of about the same size, the smallest conspicuously so. Success: of four eggs, all hatched; of four young, all probably fledged.

Nest 18. July 10, in pile of stones about half a mile east of the Base. Could hear several young begging for food, but could not locate the nest itself.

Nest 19. Found July 12. Five young, all fairly well developed. Between the Base and Davidson Point, on rocky peninsula, within 20 feet of the high-tide mark, in pile of angular stones. Ascertaining contents required moving one stone. Visited nest on July 16, finding three living and one dead young in crevices near nest. The dead one looked as if it had crawled into the crevice at the time of our visit July 12 and been unable to get out. Success: of five eggs, all hatched; of five young, at least three probably fledged.

Nest 20. Found July 12. At least three young. Saw female carrying food to nest and fecal sacs away from it. About 30 inches down in crevice near top of low rocky outcrop on Davidson Point. About twenty paces from Nest 12. We did not visit this nest again; but on July 16 we saw a male (only) caring for three short-tailed young birds which probably had been reared in it. We collected two of these, a female and a male (GMS 11757,–8). Success: of three (perhaps more) young, at least three probably fledged.

Nest 21. Found July 15. At least four young, all out of nest proper and ready to leave nest-crevice. Nest out of sight and reach in deep crevice among rocks on steep slope about 300 yards east of the building in which we lived. Parent birds feeding young regularly, but not carrying off fecal sacs. Success: of four (possibly more) young, four fledged.

Nest 22. Found July 18. Several young, which we could hear begging for food. Nest in hole among crumbling limestone well up on high talus slope at north end of Silliman's Fossil Mount, near the mouth of the Jordan River, about 16 miles west of the Base. We did not even try to reach in to this nest for fear of dislodging the rocks. Below a Peregrine's eyrie, not far from the bunting nest, we found remains of several adult buntings.

TABLE 1

TWENTY-TWO BAFFIN ISLAND SNOW BUNTING NESTS

Nest No.	Date found; contents on that date	Clutch size	No. eggs known or believed to have hatched	No. eggs known or believed not to have hatched	No. young known or believed to have died in or near nest	No. young known or believed to have fledged	Approx. date of fledging
1.	June 15 (nest barely started)	5	5	0	2	3	July 20
2.	June 19 (five eggs)	5	4	1	1	3	July 12
3.	June 22 (five eggs)	5	–	–	–	–	———
4.	June 21 (four eggs)	5	5	0	0	5	July 16
5.	June 23 (five eggs)	5	–	–	–	–	———
6.	June 24 (five eggs)	5	4	1	1	3	July 16
7.	June 24 (five eggs)	5	4	1	0	4	July 19
8.	June 26 (almost ready for eggs)	5	5	0	0	5	July 27
9.	June 26 (seven eggs)	7	–	–	–	–	———
10.	June 26 (seven eggs)	7	4	3	0	3	July 12
11.	June 27 (six young)	6	6	0	0	6	July 13
12.	June 27 (at least 4 eggs)	?	?	?	?	3	July 15
13.	July 5 (at least 4 young)	?	?	?	?	4	July 16
14.	July 5 (4 young, 1 egg)	5	4	1	0	4	July 12
15.	July 5 (5 young)	5	5	0	0	5	July 16
16.	July 9 (2 young, 5 eggs)	7	6	1	0	6	July 24
17.	July 10 (4 young)	4	4	0	0	4	July 15
18.	July 10 (several young)	?	?	?	?	?	July 15
19.	July 12 (five young)	5	5	0	1	4	July 17
20.	July 12	3	?	?	?	3	July 17
21.	July 15	?	?	?	?	4	July 15
22.	July 18 (several young)	?	?	?	?	?	July 18

Concerning the above table the following statements may be made: 1. Nests 3, 5, and 7 we collected. 2. Nests 18, 21, and 22 we never saw nor "felt into" so we know nothing about them except that they contained clamorous young. 3. Nests 12, 13, and 20 may well have held more than three, four, and four eggs or young, respectively. 4. In 16 of the 22 nests the number of eggs and/or young was as follows: in three nests, seven; in one nest, six; in 11

nests, five; in one nest, four. 5. In each of five nests with five eggs, one egg failed to hatch; in one nest with seven eggs, one egg failed to hatch; in one nest with seven eggs, three eggs failed to hatch. In the only nest with clutch-size of six, all the eggs hatched and all the young fledged (we collected one of the young). 6. Only two of the five dead young mentioned in the table did we actually find in or near the nest, but the others disappeared from some cause. 7. In 16 nests (all but 3, 5, 8, 18, 21, and 22) a total of at least 80 eggs was laid. Of these, 72 hatched and 8 did not hatch. The eggs that did not hatch were intact and translucent—*i.e.*, no embryo developed in them. 8. From 15 nests (all but Nos. 3, 5, 9, 16, 18, 21, and 22) a total of 60 young probably fledged. Nests 16 and 22 we saw only once and have no idea how the broods fared. From Nests 18 and 21 the broods probably fledged, but we have no idea how large the broods were.

The latest date on which we observed a newly built nest ready for eggs was June 26 (Nest 8). The eggs in this nest all were laid later than the five eggs of Nest 1, the last of which was laid June 26. Both Nest 1 and Nest 8 were exceptionally late. The earliest date on which we actually observed a newly hatched young bunting was July 1 (Nest 2), but on that date five of the six young in Nest 11 were so well developed that they scampered in all directions when we touched one of them. Two of this brood were able to fly a little on July 2, but they obviously preferred to stay among the stones, so calling them fledged as of that date would be misleading. We did not see other young out of nests until July 12 (Nests 2 and 14). About the middle of July a great many young birds left nests all over the area we covered most intensively; some of these were, of course, from nests we had not discovered.

The latest date on which we observed young just out of the nest near the head of Frobisher Bay was July 26 (Nest 8). On that date we saw many groups of buntings, each group composed of three or four young and a male or female parent, and we saw one adult female taking food into a crevice.

On July 28 we took special note of several young birds with apparently full-grown tails. These were going about independently of their parents. One of them tugged energetically at a plant-stem, as if trying to pull or shake something edible from it. We noted, too, on that date, a molting adult female unaccompanied by young. On July 30, at Davidson Point, we saw a worn-looking female feeding three young which followed her about, giving the characteristic food-cry of the fledgling—*zhip* or *zhi-dip*. On July 31 we looked in vain for an adult bird accompanied by young. A full-tailed young bird which we watched for some time gave a *chi-ti-ty* callnote indistinguishable from that of the adult. On August 1 we heard young birds calling *chew-kit* as well as *chi-ti-ty*. On August 2 we noted the first definite flocks of young birds. They were near the dump. They were not in close-knit companies; but

they flew up and about together, and there were no adult buntings with them. They were feeding on half-hardened seeds which they nibbled from various low-growing plants. Several young, and a few adult, Lapland Longspurs were feeding with them. Near a lake about 50 miles east-northeast of Wordie Bay, at Lat. 68° 31′ N., and Long. 71° 22′ W., we saw a female bunting feeding stub-tailed young as late as August 8.

In general it may be said that in the Frobisher Bay area the Snow Bunting's nesting started about June 10 and was over by July 26 in 1953. At Camp Kungovik, in the Bowman Bay district, in 1929, Soper (1946:424) did not find full sets of eggs until early July, and he noted the first young a-wing at Cape Alberta on July 27.

Certain of our observations between June 15 and July 31 merit special attention. First: we noted such striking differences in size among nestlings of most broods as to convince us that incubation usually started before completion of the clutch—as it did in the observed case of Nest 1. This is quite counter to Tinbergen's statement (1939:34) that incubation starts "one to three days" after the clutch has been laid. In mid-July, when many young birds were leaving their nests, we often saw some young of a given brood well enough developed to run from the nest-cup in various directions, while others remained in the nest: or some old enough to fly from the nest-crevice and make rapidly off, while others ran back to hide among the stones. These non-flying birds were definitely younger, *i.e.*, less well developed, than the fliers, a fact we proved to our satisfaction several times. True fledging is, in other words, *a leaving of the nest-crevice.* We believe it is customary for a young bird to remain in the nest-crevice until it can fly quite well. The two or three oldest birds of the brood leave with the male parent (observed July 3 and 16), and the female continues to feed the younger siblings, which stay a while longer in the nest-crevice. Most of our late observations of adults carrying food into nest-crevices were of females.

There was a gradual subsidence of singing by the males. On July 6 we heard several full-length ordinary songs and observed one flight-song. On July 7 we heard several ordinary songs and watched one male performing a flight-song several times. This individual we collected (GMS 11743), finding it to be black-billed and in boldly black and white plumage. Its testes were greatly enlarged, and the vas deferens was coiled into a large knot in the region of the anus. July 7 was the latest date on which we observed a flight-song. Ordinary songs we continued to hear now and then, especially in the morning, until July 13. Thereafter singing virtually stopped. We heard one full song near the dump early on the morning of July 27.

The postnuptial molt started about the time the young left the nest-crevice, the postjuvenal molt shortly thereafter. The two strong-winged young birds

which we collected July 16 were in full juvenal body-feather, but their remiges and rectrices were not free of sheath at the base. They were following, and being fed by, the male parent exclusively. They were dark-billed and so was their father, who appeared to be in full breeding feather (*i.e.*, not molting). On July 24, we carefully observed several dark-billed adults, deciding that their molt had not yet started. On July 28 we observed several young birds with full-length tails, some adults which appeared still to be "in quite complete plumage," and one molting adult female. On July 29, on an island near Coffin Island and well southwest of the Base, we found feathers of adult *and young* Snow Buntings below a Peregrine's eyrie. Young birds observed at Davidson Point, July 30, were molting their body plumage extensively. On August 1 all adults we saw seemed to be molting, and they were all in rough country either close to the sea or well back from it. Their bills were black. On August 1 we collected a young female (GMS 11800) in complete juvenal body-feather but with somewhat sheathed flight feathers. The bill was yellow basally, dusky at the tip. The female we saw feeding a stub-tailed young bird on August 8 (at a lake 50 miles east-northeast of Wordie Bay) seemed to be black-billed and in full breeding plumage. A female specimen (GMS 11849) collected at the Base August 18 proved to be largely in first winter feather. Even at a distance the brown tone of the head and chest, and the yellow of the bill, were readily apparent through the binocular.

Nesting Success

Obvious from Table 1 is our belief that not one of the 22 nests was destroyed by a predator. What did away with part of the brood in Nests 1, 2, 6, and 19 we cannot say. So far as we could determine, they were not killed by any sort of nest-parasite. None of the several nests we made a point of tearing to pieces was infested with mites or fleas. The dead young one at Nest 19 looked as if it had become wedged in a narrow crevice and been unable to back out.

The success of the 19 nests we observed (*i.e.*, did not collect) strikes us as remarkable. During inclement weather whole nestfuls of young Water-Pipits (*Anthus spinoletta*) died of starvation not far from bunting nests which suffered no losses at all. Young Horned Larks perished in or near their nests from starvation or exposure or both. Two young Wheatears of a brood of seven drowned in a pool at the foot of their nest-cliff. No such accident befell any of the buntings, though we did, admittedly, find a dead stub-tailed young bunting at the edge of a lake between the Base and the Hudson's Bay Company post on July 27. We were puzzled by the disappearance of one of the brood in Nest 1. The nestling may have been carried off by a lemming but, despite the great abundance of these rodents, we saw virtually nothing which clearly proved to us that they were predatory in the usual sense of the word.

As for the weasel (*Mustela erminea*), Sutton's (1932:248) experience on Southampton Island led him to believe that any weasel which might find a nestful of young buntings would certainly destroy the whole brood. We looked in vain for weasels in the immediate vicinity of the Base. The only time we recorded the mammal was, in fact, on July 22, when we collected two males (an adult and a full-grown young one) about half a mile east of the Hudson's Bay Company post. The Arctic fox (*Alopex lagopus*) too was very rare: we failed to find even a track or dropping in the area intensively studied.

The bunting's choice of nest-site is highly important to species-success. The Raven (*Corvus corax*), a potential eater of bunting eggs and nestlings, does not eat them because it cannot reach them. We took pains to examine each bunting nest from the standpoint of predation and were struck by the fact that not one of them was easily reachable by a Raven. Snowy Owl (*Nyctea scandiaca*), Peregrine, fox, or dog. A weasel could have reached many of them, perhaps any of them, but weasels were extremely rare. The abundance of lemmings probably stood the buntings in good stead, for these mammals were so readily obtainable that the owl had no occasion to molest the buntings. We visited several owl nests regularly; at not one of them did we find evidence that an owl had killed a bunting—or, for that matter, any other bird. Ravens fed regularly at the Base's dump. Abundance of food there may have reduced to some extent the sum-total of that hardy species' foraging.

Description of Specimens

Birds.—Five adult Snow Buntings (three males, two females) collected near the Base are all worn, hence without much brown in the plumage. The females are dark gray and white, not black and white, and they are much streaked, especially on the crown, nape, and hind neck. Measurements, in millimeters, are:

GMS No.	*Sex*	*Date*	*Wing*	*Tail*	*Culmen*	*Tarsus*
11714	Male	June 20	112	71.5	12	22.5
11719	Male	June 23	108	68	12.5	22.5
11743	Male	July 7	108	68	13	22
11715	Female	June 20	105	68	10.5	21.5
11720	Female	June 23	97.5	60	10	21

Males 11714 and 11743 are more boldly black and white than 11719. The last looks like a younger bird than the other two, for all the dark parts of its plumage are brown-black rather than blue-black. It is unlike the others also in that its nape is spotted with black; its primary coverts are all tipped (9 to 12 mm.) with black; all its secondaries but the two innermost bear a black spot on the outer web at the tip; and some feathers of the rump and lower back are edged with brown. In our opinion all our specimens represent the nominate race, but 11719 has certain characters of *P. n. insulae* Salomonsen,

which is believed to be resident in Iceland. Salomonsen (1951:536), discussing the differences between *nivalis* and *insulae*, says: "The typical form . . . differs by having . . . dark spots on nape lacking, primary-coverts pure white or with an apical spot of less than 10 mm., first [innermost] primary pure white or with a small black patch a few mm. large, etc." The wing, according to Salomonsen (1951:539) measures 103–115 (usually 106–113) in male *nivalis*, 103–114 in male *insulae*.

An immature female (GMS 11849) which we collected August 18 (wing, 104; tail, 67; culmen, 10.5; tarsus, 22) is in the final stages of the postjuvenal molt. The rectrices and remiges are fully unsheathed at the base. The bill is dusky at the tip, yellow basally.

Among our most interesting specimens are the two juvenal siblings (GMS 11757 and 11758, female and male respectively) taken July 16. The tail of the female is 60 mm. long, that of the male only 49 mm., clear evidence of the considerable age-discrepancy possible within one brood. The female is the browner or buffier in tone throughout, especially on the belly, and her chest is the more definitely streaked. In both specimens the bill is dusky, without a hint of yellow. Both birds were flying strongly, though their flight feathers were still sheathed at the base. No natal down whatever clings to the plumage of the head or back.

Eggs.—The single egg collected July 9 is decidedly the least marked, and therefore the palest, of the 18 eggs we collected. It is bluish white with a sprinkling of very fine pale brown dots. The dots form a vague wreath around the larger end. The egg measures 22.8 × 16.2 mm.

The set of five collected June 22 are alike in having a strongly bluish white ground-color and comparatively few markings. Most of the markings (pale purplish gray blotches and scattered dark brown dots and scrawls) are at the larger end, where they tend to form a wreath. The eggs measure: 21.1 × 15.2, 22.1 × 16.0, 21.4 × 15.6, 22.2 × 15.9, and 21.3 × 15.7 mm.

The set of five collected June 23 are wreathed at the larger end with brownish gray blotches and dots and there are a few scattered dark scrawls all over each egg. The eggs measure: 22.0 × 15.3, 22.3 × 15.1, 22.2 × 15.8, 22.9 × 15.8, and 22.9 × 15.7 mm.

The set of seven collected June 26 are all heavily marked, resembling, in that respect, eggs of the Lapland Longspur. In four of them the prevailing tone is a warm shade of brown; in three it is gray, and in these three the blotching is concentrated about the larger end. They measure: 21.1 × 16.1, 21.1 × 16.0, 20.8 × 16.1, 20.4 × 16.3, 20.9 × 16.2, 20.3 × 16.1, and 20.8 × 16.1 mm.

In size the 18 eggs average 21.58 × 15.84 mm.

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Summary

1. At the head of Frobisher Bay, Baffin Island, in the summer of 1953, the Snow Bunting was the commonest land bird. Twenty-two nests found by us in June and July were all under, or among, rocks. Some of them we could neither reach nor see.

2. Clutch-size or brood-size in 16 of the 22 nests was as follows: four (one nest); five (11 nests); six (one nest); seven (three nests).

3. Young from 19 of the 22 nests fledged from about July 3 (brood of six) to about July 27 (brood of five). Average approximate date of fledging: July 16. At a lake 300 miles north of the head of Frobisher Bay we saw a female bunting feeding a stub-tailed young one just out of the nest, August 8.

4. About 35 days were required for producing a brood: four days for nest-building; four to seven days for egg-laying; 12½ to 13 days for incubating; and 12–14 days for fledging. We obtained no evidence of two-broodedness.

5. Nests were built entirely by the female, but the male accompanied the female while she was gathering material. Not once did we observe copulation, but this might have taken place in the nest-crevice.

6. A nest started June 15 was ready for lining on June 19. By June 20 much dog hair had been added. By June 21 white ptarmigan feathers had been added and the first egg laid. The third egg was laid between 2:01 and 5:17 a.m., June 24; the fifth egg between 4:00 and 4:55 a.m., June 26. Incubation started just after the laying of the third egg. Hatching of the fifth egg took place at least 12 days and 9 hours, at most 13 days, one hour, and 10 minutes after it had been laid.

7. The female incubated the eggs. She was fed by the male (presumably at the nest proper) throughout the incubation period. A *churr* callnote from her accompanied feeding. This *churr* resembled the food-cry of the nestling. When the incubating female left the nest-crevice for food or exercise she was sometimes accompanied by the male.

8. Newly hatched nestlings produced no sound when opening their mouths for food. When about two days old they produced a faint food-cry. This cry gradually became stronger. When the young were about ten days old the chorus of begging was audible to the human ear several rods from the nest.

9. Young left the nest proper when about ten or eleven days old, before they could fly well. When they left the nest-crevice, a day or so later, they flew strongly. At this stage their tails were about 20 mm. long. The oldest two or three siblings left the nest-crevice in advance of the others and were fed exclusively by the male; the younger siblings, as long as they remained in the nest-crevice, and probably for several days thereafter, were fed exclusively by the female.

10. Both the male and female bunting carried food to the nest direct, and both carried away fecal sacs. We never saw one adult transfer food to another adult.

11. The food-cry of the young bunting after leaving the nest-crevice was *zhip* or *zhi-dip*. The young bird continued to use this cry for several days after leaving the nest-crevice. It began obtaining food for itself well before its remiges were full-grown. When it began obtaining its own food it flocked loosely with other young buntings.

12. Three of the 22 nests found we collected. Of 80 eggs laid in 16 nests, 72 hatched (in eight eggs which did not hatch no embryos developed). From 15 nests a total of 60 young probably fledged. All of the 19 nests not collected as specimens were more or less successful. From each of two nests one nestling mysteriously disappeared. The most likely predator: a lemming, for lemmings were common, but we obtained no proof that a lemming even visited either nest.

13. We found remain of buntings in the vicinity of three Peregrine Falcon eyries; but we found no bunting remains at any of several Snowy Owl nests which we visited regularly.

14. The inaccessibility of bunting nests to such predators as ravens, owls, foxes and dogs greatly aids the species in its survival.

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